

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) EP 1 148 597 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.10.2001 Bulletin 2001/43

(51) Int Cl.7: H01R 24/00

(21) Application number: 01107513.2

(22) Date of filing: 26.03.2001

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: Goto, Masayuki
Shinagawa-ku, Tokyo (JP)

(74) Representative: Pätzold, Herbert, Dr.
Pätzold, Tandler, Riegger & Kollegen,
Steubstrasse 10
82116 Gräfelfing (DE)

(30) Priority: 28.03.2000 JP 2000087871

(71) Applicant: HIROSE ELECTRIC CO., LTD.
Shinagawa-ku Tokyo (JP)

(54) Electrical connector

(57) An electrical connector (10) comprises a connector housing (11) having a side wall (13) to define a receiving space (14) for receiving a mating connector (30) mounted on a surface (P2) by means of a connection section (42A) of a contact element (40) that extends outwardly from a housing (31) of the mating connector (30); at least one guiding section (17) provided on a front

face of the side wall (13) in an area where no connection section of the mating connector is present and accommodating the connection section (42A) of the mating connector (40) when the mating connector (40) is plugged into the electrical connector (10); and at least one guiding face (18) provided on the guiding section (17).

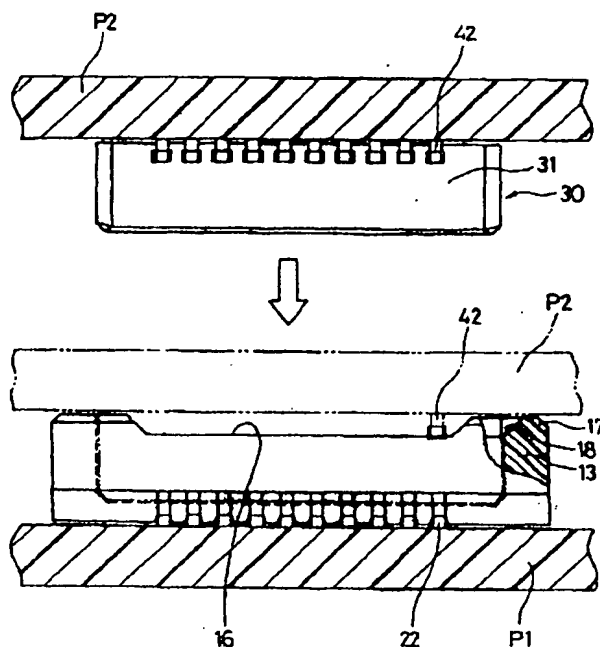


FIG. 2

EP 1 148 597 A2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 10 7513

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|---|--|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
| X | US 5 885 092 A (ITO TOMOAKI ET AL) 23 March 1999 (1999-03-23) * abstract * * figures 2,9-11 * | 1-7 | H01R12/22 |
| X | US 5 975 916 A (OKURA KENJI) 2 November 1999 (1999-11-02) * abstract * * figures 2,3,6,7 * | 1-4,6,7 | |
| X | US 5 885 093 A (VAN KOETSEM JAN PETER KAREL ET AL) 23 March 1999 (1999-03-23) * the whole document * | 1-4,6,7 | |
| X | US 5 888 077 A (VAN KOETSEM JAN PETER KAREL ET AL) 30 March 1999 (1999-03-30) * the whole document * | 1-4,6,7 | |
| A | EP 0 510 995 A (AMP INC) 28 October 1992 (1992-10-28) * abstract * * figures 3-6,9,10 * | 1-7 | |
| The present search report has been drawn up for all claims | | | TECHNICAL FIELDS SEARCHED (Int.Cl.7) |
| | | | H01R |
| Place of search MUNICH | | Date of completion of the search 22 July 2003 | Examiner Chelbosu, L |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p> | | | |

EPO FORM 1503 (03.02) (P04C01)

contact elements 40 are provided on the inside faces of the receiving cavity 33. Each contact element 40 is stamped from a metal sheet to provide a contact section 41 supported on the inside face of the receiving cavity 33 and a leg section 42 extending outwardly from the contact section 41 to the outside of the housing 31 to form a connection portion 42A that is level with or slightly higher than the bottom face 31A of the housing 31. The mating connector 30 is mounted on the circuit board P2 and the connection portions 42A are soldered to the corresponding circuit traces.

[0013] In use, when the mating connector 30 is plugged into the connector 10, the guiding sections 17 outside the arranging area X1 accommodate the leg portions 42 of the mating connector 30 as shown by phantom line in Fig. 3. Consequently, the front face of the guiding sections 17 is brought very close to the circuit board P2 of the mating connector 30.

[0014] The large guiding faces 18 make it easy to receive the mating connector 30. Where large guiding faces 10 are not required, the height of the connector can be reduced. Plugging the connectors mounted on the circuit boards is very difficult, and the guiding faces are very helpful.

The reduction of the connector height makes it possible to reduce the size of the equipment using the connector. The step-down faces 16 of the side walls 13 and the front face of the protruded land 12 lie in the same plane so that when the connector 10 is transported by a vacuum device to the circuit board, the side walls 13 is also supported by the vacuum device to thereby stabilize the posture of the connector 10. The protruded 1 and 12 is not essential for the invention because the surrounding wall defining a receiving cavity is sufficient to receive the mating connector.

[0015] The sloped guiding faces may be provided on the mating connector. The relative position between the guiding faces and the leg portions of the mating connector is the same as that of Figs. 1-3. Fig. 4 shows a guiding section 17' of the connector 10 and such a sloped guiding face 31B provided on the housing 31 of a mating connector 30. Such guiding faces as the ones 18 and 31B may be provided on both the connectors 10 and 30, respectively. In the above embodiments, a guiding face may be provided on any segment of the C-shaped guiding section 17. The contact elements may be made by bending as well as stamping.

[0016] As has been described above, according to the invention, the guiding faces are provided on the housing to accommodate the leg portions of a surface mounted mating connector so that not only the guiding faces can be made large without increasing the connector height in the plugging direction but also the guided plugging operation is made easy. In other words, if the guiding faces are the same in size as the conventional ones, it is possible to reduce the connector size in the plugging direction. In addition, the front face of the guiding section is brought so close to the circuit board of a mating con-

connector that the stable plugging condition is obtained.

Claims

1. An electrical connector comprising:

a connector housing having a side wall to define a receiving space for receiving a mating connector mounted on a surface by means of a connection section of a contact element that extends outwardly from a housing of said mating connector;

at least one guiding section provided on a front face or said side wall in an area where said connection section of said mating connector is not present and accommodating said connection section of said mating connector when said mating connector is plugged into said electrical connector; and

at least one guiding face provided on said guiding section.

2. The electrical connector according to claim 1, wherein said guiding section is provided in an area where no contact element is provided.

3. The electrical connector according to claim 1 or 2, wherein said guiding section has a first segment extending in a first direction in which contact elements are arranged and a second segment extending in a second direction perpendicular to said first direction.

4. The electrical connector according to claim 3, wherein a pair of said guiding sections are provided on opposite sides or said connector housing in said first direction.

5. The electrical connector according to claim 1, wherein said connector housing has a front face that is in the same level except for said guiding section.

6. The electrical connector according to claim 1, wherein said electrical connector is of surface mount type.

7. An electrical connector system including first and second electrical connectors, wherein said first electrical connector comprises:

a first housing;

at least one contact element having a leg section extending outwardly to provide a connec-

tion portion that is surface mounted on a first surface; and said second electrical connector comprises:

a second housing having a side wall to define a receiving space for receiving said first electrical connector that is surface mounted on said first surface; 5

at least one guiding section provided on a front edge of said receiving space or a front edge of said first housing; and 10

at least one guiding face provided on said guiding section for accommodating said leg section of said first electrical connector when said first electrical connector is plugged into said second electrical connector. 15

20

25

30

35

40

45

50

55

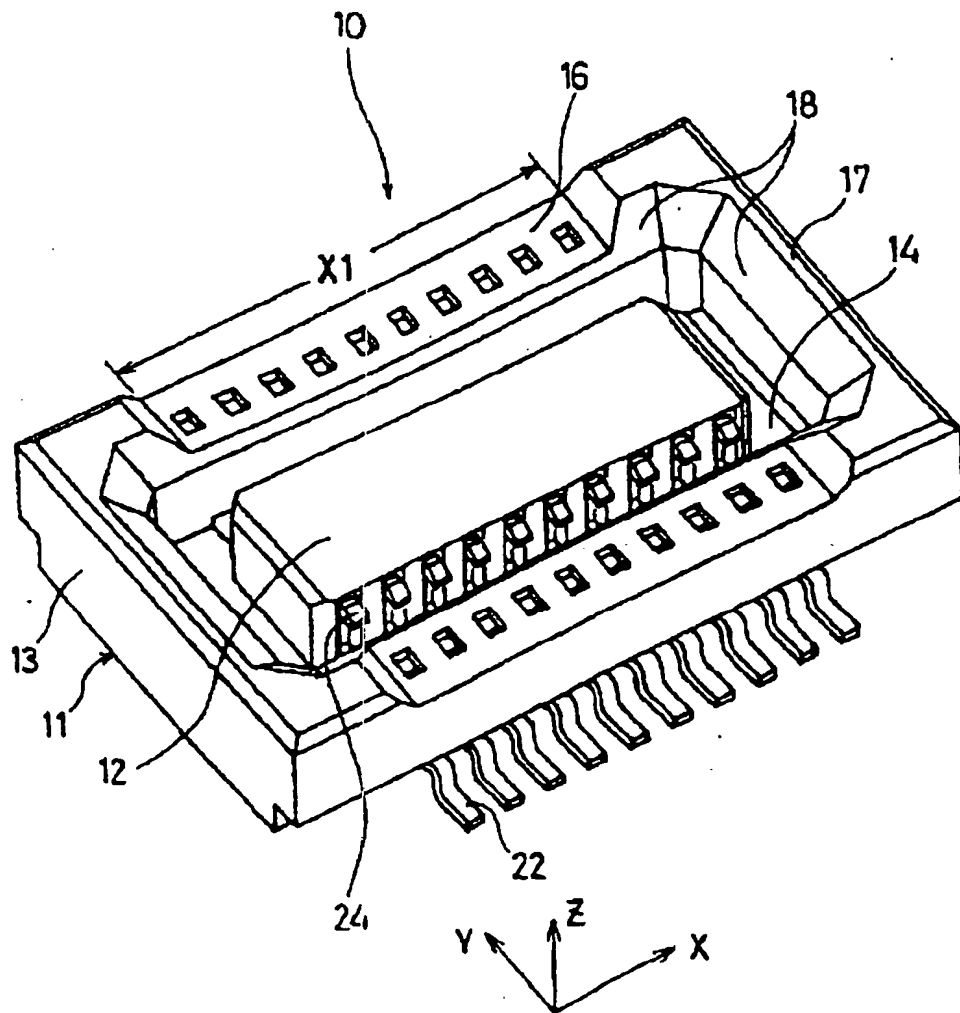


FIG. 1

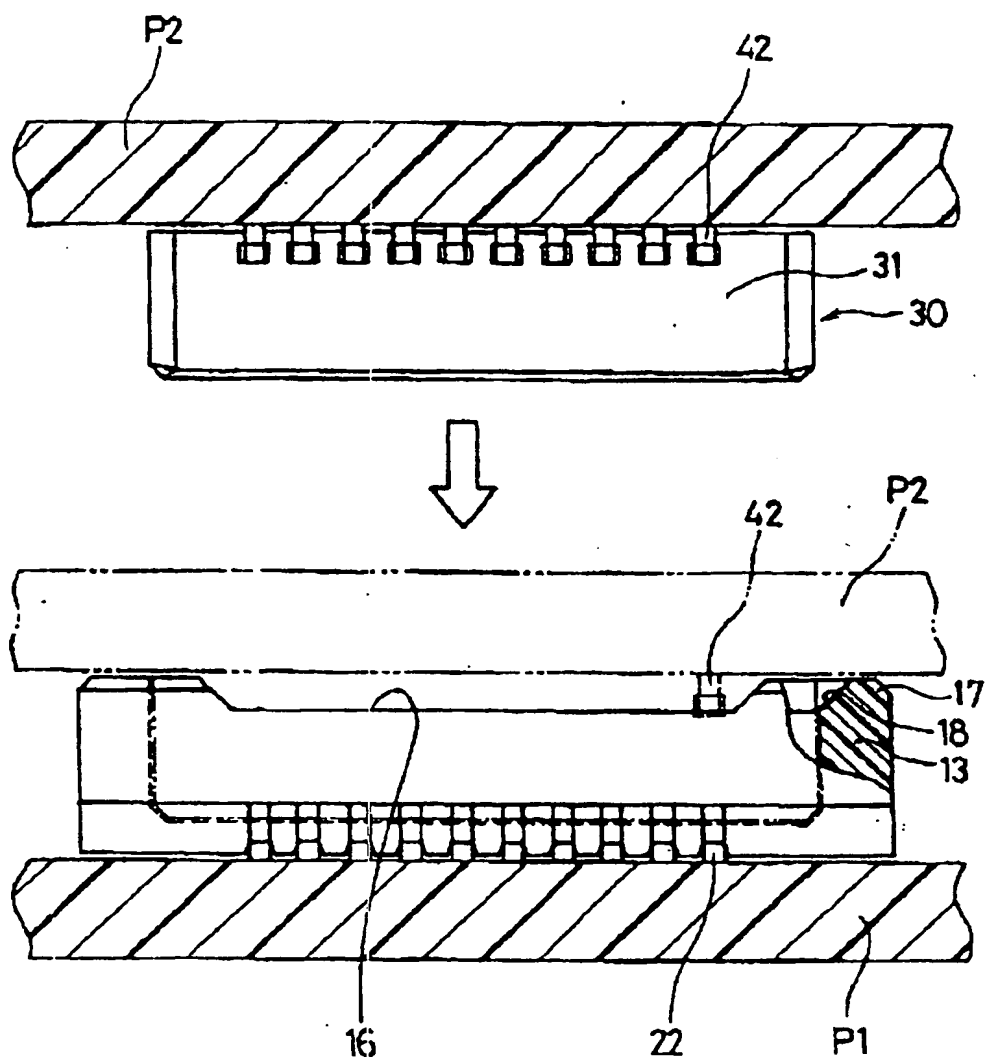


FIG. 2

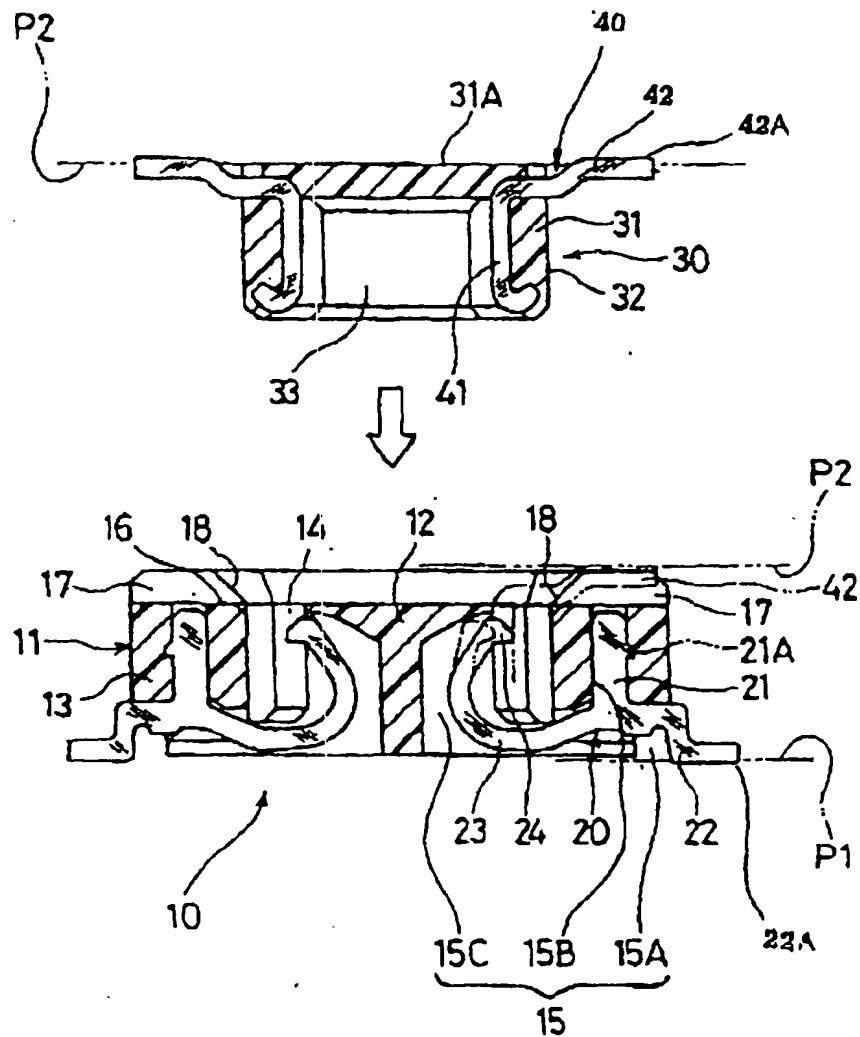


FIG. 3

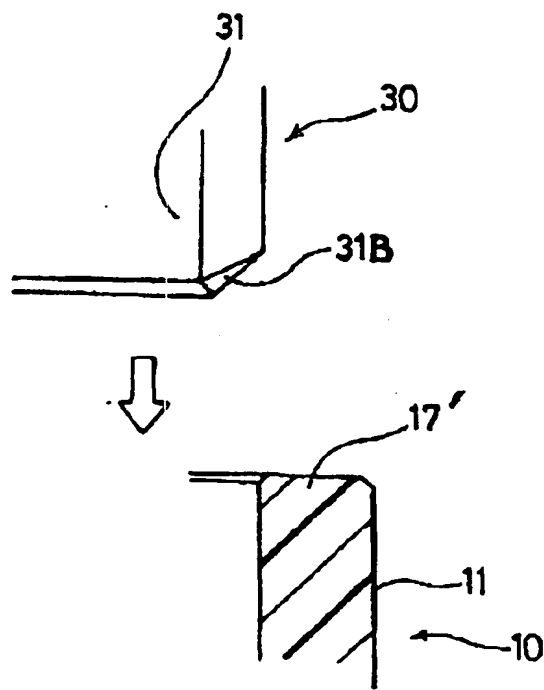


FIG. 4

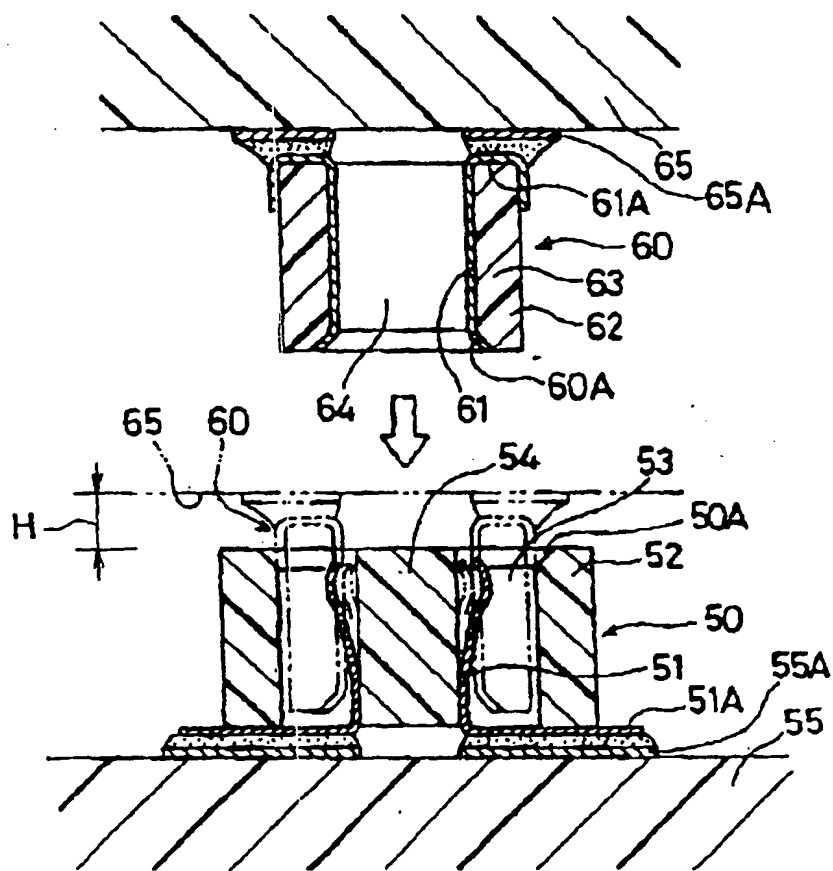
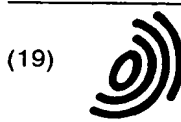


FIG. 5 PRIOR ART



(19)

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 148 597 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
17.09.2003 Bulletin 2003/38

(51) Int Cl.7: H01R 12/22

(43) Date of publication A2:
24.10.2001 Bulletin 2001/43

(21) Application number: 01107513.2

(22) Date of filing: 26.03.2001

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: Goto, Masayuki
Shinagawa-ku, Tokyo (JP)

(74) Representative: Pätzold, Herbert, Dr.
Pätzold, Tandler, Riegger & Kollegen,
Steubstrasse 10
82116 Gräfelfing (DE)

(30) Priority: 28.03.2000 JP 2000087871

(71) Applicant: HIROSE ELECTRIC CO., LTD.
Shinagawa-ku Tokyo (JP)

(54) Electrical connector

(57) An electrical connector (10) comprises a connector housing (11) having a side wall (13) to define a receiving space (14) for receiving a mating connector (30) mounted on a surface (P2) by means of a connection section (42A) of a contact element (40) that extends outwardly from a housing (31) of the mating connector (30). at least one guiding section (17) provided on a front face of the side wall (13) in an area where no connection section of the mating connector is present and accommodating the connection section (42A) of the mating connector (40) when the mating connector (40) is plugged into the electrical connector (10); and at least one guiding face (18) provided on the guiding section (17).

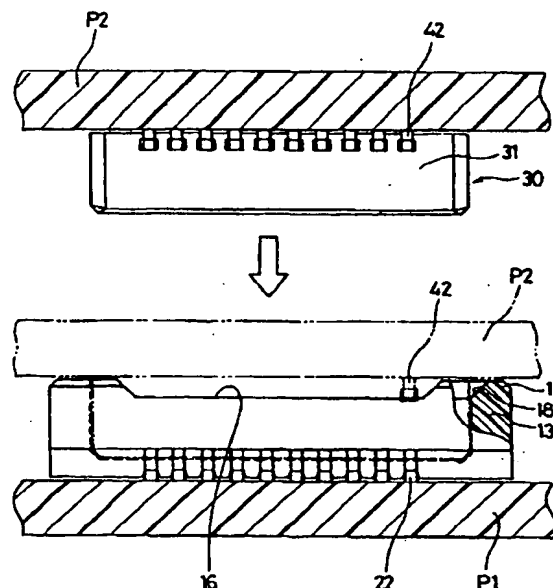


FIG. 2

EP 1 148 597 A3

Description

[0001] The present invention relates to electrical connectors and, more particularly, to an electrical connector for plugging with a mating connector that is surface mounted on a circuit board, etc,

[0002] Japanese patent application Kokai No. 8-148240 discloses a connector system of this type. As shown in Fig. 5, this connector system comprises a pair of connectors 50 and 60 that are surface mounted on circuit boards 55 and 65, respectively, and plugged with each other. Each contact, element 51 for the connector 50 has an L-shaped form and a connection section 51A extending along the attachment face of the housing 52. Each contact element 61 for the connector 60 has a U-shaped connection section 61A along the attachment face of a housing 62. The connection sections 51A and 61A are soldered by surface mount techniques to circuit traces 55A and 65A of the circuit boards 55 and 65, respectively.

[0003] In use, the plugging projection 54 of the connector 50 is plugged into the receiving cavity 64 defined by the wall section 63 of a housing 62 of the connector 60, with the wall section 63 being plugged into the receiving space 53 provided in a housing 52 of the connector 50. The edges of the receiving space 53 and the receiving cavity 64 are tapered to form guiding faces 50A and 60A, respectively, facilitating the plug-in operation.

[0004] There is a demand for reducing the height of the plugged-in connectors to reducing the distance between the boards, minimizing the equipment size. Even if the connector 60 is plugged completely in the connector 50 as shown by phantom lines, there is a gap (H) between the circuit board 65 and the front face of the connector 50, hindering the miniaturization. These connectors are already very compact, and it is impractical to reduce the size of the guiding faces 50A and 60A for the miniaturization.

[0005] Accordingly, it is an object of the invention to provide a surface-mount electrical connector having a low plug-in height with a satisfactory guiding face.

[0006] The above object is achieved by the invention as recited in claim 1.

[0007] Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an electrical connector according to an embodiment of the invention;

Fig. 2 is a side view of the connector with a mating connector as viewed in the Y direction of Fig. 1;

Fig. 3 is a sectional view of the connector with the mating connector taken along a YZ plane of Fig. 1;

Fig. 4 is a side view or part of an electrical connector

with a mating connector according to another embodiment of the invention; and

Fig. 5 is sectional view of a conventional electrical connector.

[0008] In Fig. 1, a connector 10 comprises a housing 11 having a thin rectangular form extending in the X and Y directions and a protruded land 12 at the center. A receiving space 14 is defined by the protruded land 12 and a surrounding wall 13 so as to open in the Z direction. A mating connector 30 is plugged into the receiving space 14 as shown by phantom lines in Fig. 2.

[0009] A plurality of contact elements 20 are arranged in the X direction on opposite sides of the housing 11. Each contact element 20 is stamped out of a metal sheet extending in the Y and Z directions. As best shown in Fig. 3, the contact elements 20 are disposed symmetrically and each have a central fixing section 21, a leg section 22 extending outwardly from the fixing section 21 in a Z-shaped form, forming a connection portion 22A at the end, and a resilient arm 23 extending inwardly from the fixing section 21 in a C-shaped form to provide a contact portion 24 at the free end. The fixing section 21 extends upwardly and has an engaging projection 21A. The connection portion 22A is level with or slightly lower than the bottom face of the housing. The connection portion 22A is placed on a circuit board P1 and soldered to a circuit trace of the circuit board P1.

[0010] A plurality of receiving slots 15 are provided in the housing 11 to receive the contact elements 20. Each receiving slot 15 opens at the bottom of the housing 11 and an entrance, portion 15A for accommodating a linking area where the fixing section 21, the leg section 22, and the resilient arm 23 are linked, a fixing groove 15B into which the fixing section 21 is press fitted, and a slot cavity 15C provided in the protruded land 12 to permit resilient deformation of the resilient arm 23. Each contact element 20 is inserted into one of the receiving slots 15 from below. The engaging projection 21A of the fixing section 21 engages the inner surface of the fixing groove 15B to secure the contact element 20 to the housing 11 such that the contact portion 24 projects into the receiving space 14 of the housing 11.

[0011] The front face of the housing 11 has pair of step-down faces 16 in an arranging area X1 where the contact elements 20 are arranged in the X direction, forming a pair of C-shaped guiding sections 17 on opposite sides of the housing 11. Sloped guiding faces 18 are provided on the front inner edges of the guiding sections 17, extending downwardly more than the step-down faces 16.

[0012] The mating connector 30 is mounted on the surface of a board P2 (SMT). The outside form 32 of a housing 31 is made to match the shape of the receiving space 14 of the connector 10. A receiving cavity 33 is provided at the center of the housing 31 to receive the protruded 1 and 12 of the connector 10. A plurality of

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 01 10 7513

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-07-2003

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US 5885092 A | 23-03-1999 | JP 3116300 B2 | 11-12-2000 |
| | | JP 10022015 A | 23-01-1998 |
| | | CN 1173056 A ,B | 11-02-1998 |
| | | EP 0814645 A1 | 29-12-1997 |
| | | TW 424991 Y | 01-03-2001 |
| US 5975916 A | 02-11-1999 | JP 10162913 A | 19-06-1998 |
| | | DE 19751970 A1 | 10-09-1998 |
| | | FI 974304 A | 27-05-1998 |
| | | KR 263597 B1 | 01-08-2000 |
| | | TW 379468 B | 11-01-2000 |
| US 5885093 A | 23-03-1999 | FR 2752098 A1 | 06-02-1998 |
| | | BE 1010511 A3 | 06-10-1998 |
| | | CA 2210542 A1 | 02-02-1998 |
| US 5888077 A | 30-03-1999 | FR 2752097 A1 | 06-02-1998 |
| | | BE 1010510 A3 | 06-10-1998 |
| | | CA 2210543 A1 | 02-02-1998 |
| EP 0510995 A | 28-10-1992 | US 5127839 A | 07-07-1992 |
| | | DE 69208718 D1 | 11-04-1996 |
| | | DE 69208718 T2 | 02-10-1996 |
| | | EP 0510995 A2 | 28-10-1992 |
| | | JP 3294634 B2 | 24-06-2002 |
| | | JP 5299143 A | 12-11-1993 |
| | | JP 2002289311 A | 04-10-2002 |

EPO FORM P0455

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82